Automatic Midsurfacing with the 3D Medial Object

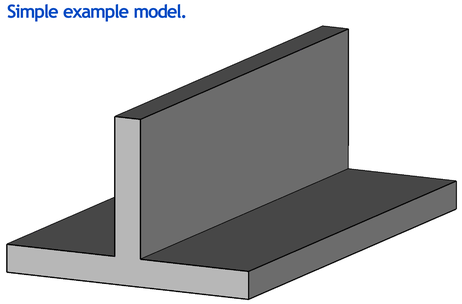
Shakeel Seebooa, Claire Pollard

http://www.cadfix.com
euinfo@iti-global.com
CADfix
ITI International TechneGroup

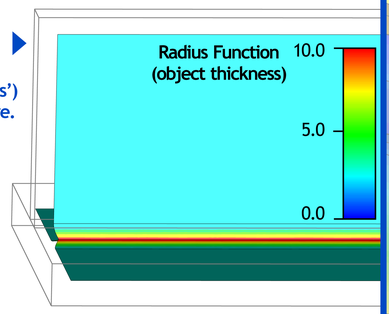
Algorithm:

A midsurface is a dimensionally reduced representation of a CAD model for use in downstream advanced simulation processes such as FEA, CEM and CFD. By reducing a model to its midsurface, shell element meshing can be applied instead of solid meshing, greatly reducing degrees of freedom for a more efficient analysis.

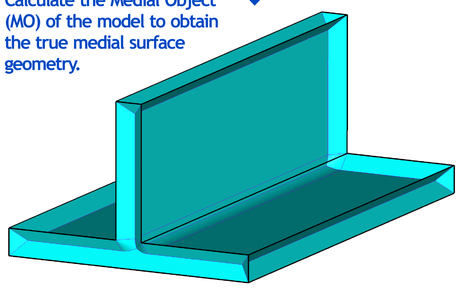
Simple example model.



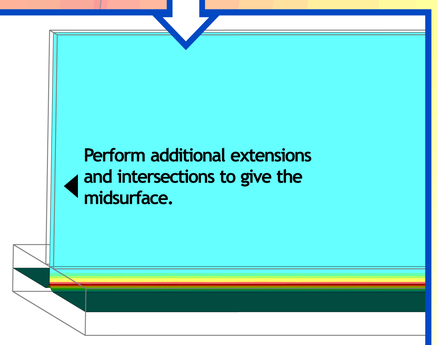
Identify unwanted surfaces ('edge flaps') and remove.



Calculate the Medial Object (MO) of the model to obtain the true medial surface geometry.

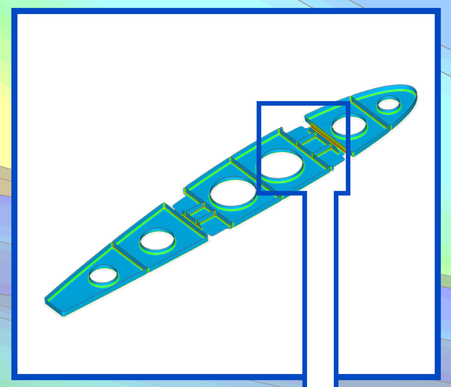


Perform additional extensions and intersections to give the midsurface.

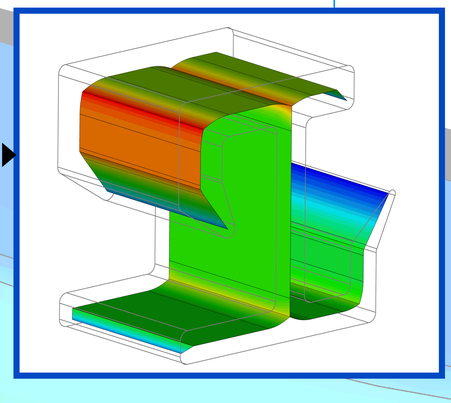


Examples:

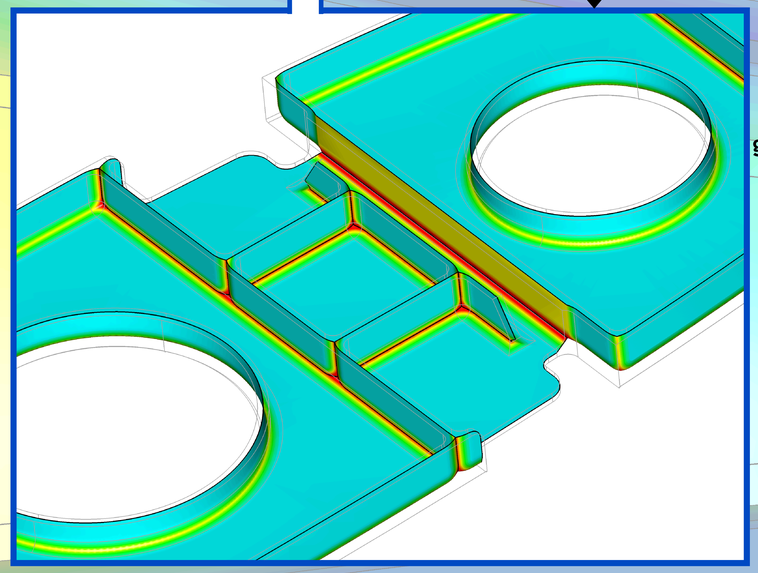
Examples of automatic midsurface results generated in CADfix



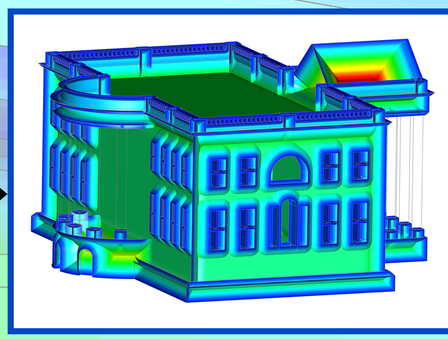
Midsurface generated for solid with varying thicknesses and tapering end walls

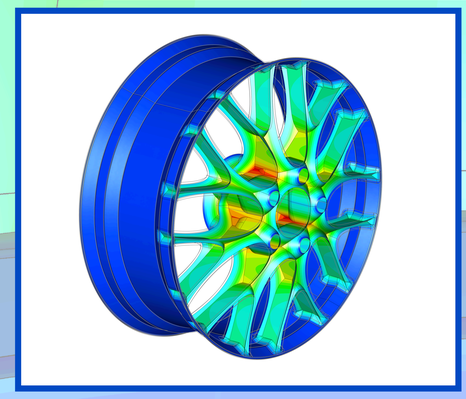


Complex aircraft rib geometry, midsurface automatically generated



Complete auto generated MO of complex geometry

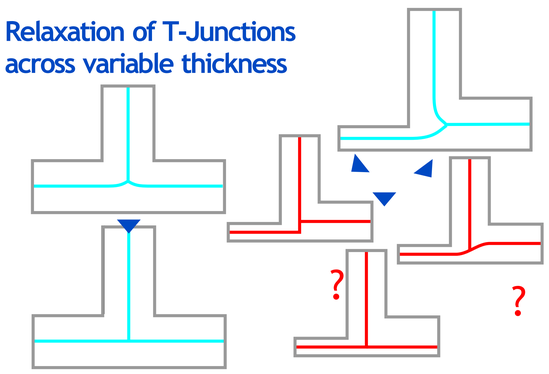




Discussions:

Several challenges remain. Depending on the type of analysis being undertaken, users will require different configurations at complex junctions, intersections and extensions. Part of the problem involves establishing the configurations required to give the optimum midsurface for different analysis applications.

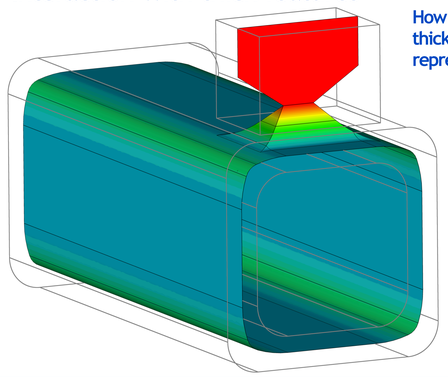
Relaxation of T-Junctions across variable thickness



Correct answer is application dependent

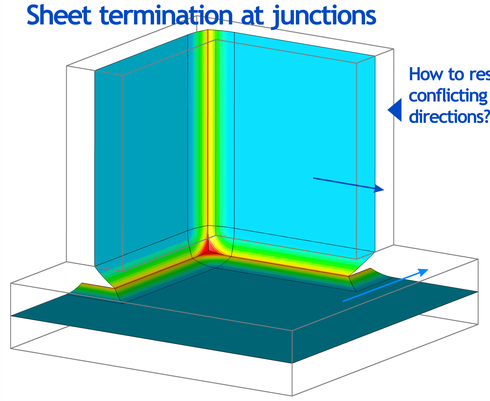
Interaction with thick features

How should the thick feature be represented?

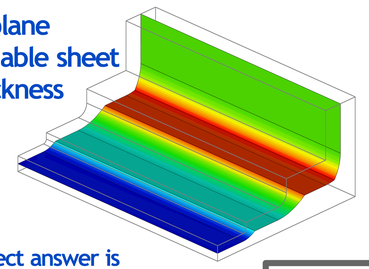


Sheet termination at junctions

How to resolve conflicting extension directions?



In-plane variable sheet thickness



Correct answer is application dependent